

SOME ARABIAN MAMMALS COLLECTED BY  
MR. H. ST. J. B. PHILBY, C.I.E.

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(With Plate VI and 8 text-figures.)

INTRODUCTION

ARABIAN mammals were first discussed systematically by Cretzschmar (1826), Lichtenstein (1827-34) and Hemprich & Ehrenberg (1828-33). Since then little was written till Thomas (1894B) wrote on the mammals of Oman. This was quickly followed by discussions of the Aden mammals by Yerbury & Thomas (1895) and Thomas (1900). Since that time there have been many papers (see Appendix I) on individual forms, notably by Thomas, but only three papers dealing with any considerable collections: Cheesman & Hinton (1924) on mammals collected by Cheesman between Riyadh and the east coast, Dollman (in B. Thomas 1932) on collections by Bertram Thomas in the south-east and Pocock (1935A) on Thomas's specimens once more and on a collection from various parts of Arabia presented to this museum by Philby.

Now Philby has sent home another fine collection, the results of his recent journey to the Rub al Khali (Philby 1938), and it is with these specimens that this paper is principally concerned though the earlier material has been re-examined.

Apart from the fact that Arabia is still relatively unknown zoologically, natural history collections from that country are of the greatest interest from the zoogeographical point of view. Arabia lies between the Ethiopian, Palaearctic and Indian regions and the extent to which each region has contributed to the fauna has been a matter of speculation ever since 1866 when Murray wrote on the geographical distribution of mammals.

The Red Sea is almost certainly a rift valley and the land connexion between Aden and Somaliland does not appear to have been broken until late in the Tertiary period. Pilgrim (1919, Pl. I; 1925A, p. 73; 1925B, p. 202) shows that the land bridge across the Straits of Hormuz between Oman and Persia lasted at all events until the end of the Pliocene and probably till the late Pleistocene.

In view of the above it might be expected that south-eastern Arabia should show faunistic affinities with Africa and that Oman should have Persian and Indian relationships, and this is in fact the case. The Arabian Tahr (*Hemitragus jayakari* Thos.), a goat-like animal living in the mountains of Oman, is an interesting case. It is a close relative of the Tahr which is found on the southern slopes of the Himalaya and the one in the hill ranges of southern India. It is essentially a mountain animal and there do not appear to have been mountains along the land route which the Tahr would have had to have followed if there had been no bridge across the Straits of Hormuz. Oman has not been explored from the mammal point of view since Dr. Jayakar's time, and it would be interesting to find out if

there are any Oriental forms there; that is, truly Oriental as opposed to Indian.

Some elements of the fauna are common to India and Africa. Philby's latest collection includes some gerbils of the genus *Tatera* (a new record for Arabia) which ranges as far as Ceylon on the one hand and S. Africa on the other, but the connexion between these two extremes may be independent of land bridges across the south ends of the Red Sea and the Persian Gulf, as the genus has been recorded from the top end of the Persian Gulf.

The largest of the Arabian foxes (*Vulpes vulpes* L.) is common to N. Africa, Arabia and N.W. India, but it is not to be regarded as a true Ethiopian or Indian form, but as a Palearctic intruder.

Lastly there are some Arabian mammals such as the hyrax (*Procavia*) which are found elsewhere only in Africa, Palestine and Syria.

The Arabian fauna, therefore, is of mixed origin and offers many interesting problems. More specimens are needed to solve these, apart from the entirely philosophical object of finding out what mammals live in Arabia, and any specimens sent to the British Museum will be gratefully acknowledged.

Throughout this paper the use of parentheses for the names of authors of species which have been moved to another genus has been discontinued—for reasons given by Dr. Osgood (1939), *Science*, **89**: 9. Conventions used with regard to certain measurements have been explained in Appendix II and a list of the co-ordinates of those Arabian localities which are hard to find in maps has been given in Appendix III.

I should like to take this opportunity of thanking my colleagues in the Mammal Room for their various suggestions and help,<sup>1</sup> especially Mr. R. I. Pocock, F.R.S.

### 1. (?) *Procavia syriaca jayakari* Thos.—Hyrax.

*Procavia syriaca jayakari* O. Thomas 1892, *Proc. Zool. Soc. Lond.*, p. 63, type loc.: Dofar; id., 1894, l.c., p. 455, Dofar; id., 1900, l.c., p. 104, Abyan Mts.; R. I. Pocock, 1935, *Ann. Mag. Nat. Hist.* **15**: 455, Ilha' az & Deriyot.

*Procavia habessinica jayakari* Thos., H. Hahn, 1934, *Z. Säugetierk. Berlin*, **9**: 302.

Number	Sex.	Head and body.	Hind-foot.	Locality.	Growth stage.	Date.	Condylol-basal.	Mandibular length.	Breadth of M <sup>1</sup> .
148	♂	384	57	W. Hanaka	VIII <sup>2</sup>	24.xi.1936	—	60	7.1
147	♀	—	—	W. Hanaka	V	24.xi.1936	68	52	6.2
107	♂	357	56	Najran	IV-V	12.vii.1936	67	50	6.0
Type	♂	—	—	Dofar	VIII	1891	77	59	6.3

There is much variation in the colour of these specimens. Number 107 agrees fairly well with the type, but numbers 147 and 148 show more buff and black amongst the hairs and agree better with two of Bertram Thomas's specimens from Deriyot (B.M. 34. 8. 4. 22-23) and one of Bury's from Wasil in Yemen (B.M. 13. 6. 19. 11). None of these specimens is so uniformly coloured dorsally as the type and their bellies are creamy buff and not ochraceous as in the latter. In fact, some of these agree better with specimens of *ruficeps* and *burtoni* than with *jayakari*.

<sup>1</sup> The identifications of the bats are due to Mr. R. W. Hayman.

<sup>2</sup> For growth stages see Thomas, 1892, *Proc. Zool. Soc. Lond.*, p. 53.

2. *Procavia* sp.—Hyrax.

Number 149, a young ♂ (growth stage II) from Jadaliya, 26 November, 1936, and number 57, ♂ (growth stage V–VI) from Dha’f Hills, Wadi Fatima, 25 January, 1935.

These specimens are alike in colour and differ widely from *jayakari*. The following description is of number 57.

Dorsally—finely speckled black and buff, the hairs being very dark at the base, buff in the middle and black at the tip, giving a brindled effect. The buff dorsal spot is very distinct. The hairs are much shorter than in *jayakari*, 20 mm. as opposed to 30 mm. I have examined many skins of *Procavia* from Egypt and the Sudan, as well as from Sinai and farther north, and the nearest specimen to this one, so far as colour is concerned, is one from Rejaf, S. Sudan (B.M. 28. 3. 11. 71), which was left unidentified.

Ventrally—silvery grey with a slight buff wash.

Hands and feet—as back.

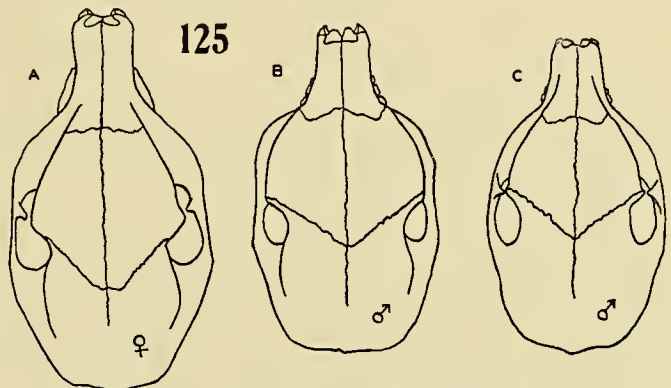
Skull—proportionately broader in the lachrymal region than any other Arabian specimen I have seen (text-fig. 125 B). Hahn (1934, p. 294), who makes *jayakari* a subspecies of *habessinica*, says of the latter species: “ $P_1$  verkümmert. Stets einzelwurzellig.”<sup>1</sup> The specimens which I have called *jayakari* agree with this but number 57 has  $P_1$  well developed and two-rooted; number 149 has  $Pd_1$  strongly developed and two-rooted.

The dimensions of number 57 are: head and body 376, hindfoot 61, ear 30 millimetres.

Skull: condylobasal length 71, zygomatic breadth 43, postorbital width 26, maximum width across frontals 35, mandibular length 55, breadth of  $M^1$  6.25 millimetres.

Hommel, in *Die Namen der Säugethiere bei den südsemitischen Völkern*, Leipzig, 1879, says (p. 322): “Die Araber beschrieben es als ein Tierchen, kleiner als die Katze, braun, mit schönen Augen, ganz kurzem Schwanz, welches in Häusern gezogen und gegessen wird, weil es das Gemüse abfrisst; es gehöre zum Geschlecht der Wiesel und die Leute nennen es ‘ganamu bani Isra’il’ (Kleinvieh der Kinder Israel).”

<sup>1</sup> It is as well to add that many of the forms which Hahn includes in *habessinica* may show a two-rooted  $P_1$  and so belie his “stets einzelwurzellig.” I have seen two specimens of *burtoni* from Eirerib, Sudan; one of *shoana* from Shoa; the type of *butleri* from Jebel Fazogli, and one of *jacksoni* from Nakusa, B.E.A., all of which have  $P_1$  two-rooted and strong. These specimens are all in stage VIII, so there is no question of  $P_2$  being mistaken for  $P_1$ .



TEXT-FIG. 125.—Skulls of Arabian *Procavia*: (A) the type of *P. syriacajayakari* Thomas (stage VIII) from Dofar; (B) Mr. Philby’s No. 57 (stage V–VI) from Dha’f Hills; (C) Mr. Philby’s No. 147 (stage V) from Wadi Hanaka. Drawn to the same scale, measurements in text.



Hyraxes are no longer kept in captivity,<sup>1</sup> but their great variability may be due in part to feral forms of ancient domestic stocks.

I therefore propose to wait till more specimens come to hand before adding more names to this already crowded genus.

### 3. *Capra hircus sinaitica* Hempr. & Ehrenb.—Ibex.

*Capra sinaitica* Hemprich & Ehrenberg 1830 (1833), *Symbolae Physicae Mammalium*, 2: folio kk recto, type loc.: Upper Egypt and Sinai; Yerbury & Thomas, 1895, *Proc. Zool. Soc. Lond.*, p. 555, Aden; Thomas, 1900, *Proc. Zool. Soc. Lond.*, p. 104, Abyan Mts.

*Capra Mengesi* Noack 1896, *Zool. Anz.*, 19: 353, type loc.: Hadhramaut; Noack, 1897, l.c., 20: 365; Selater, 1897, *Proc. Zool. Soc. Lond.*, p. 900; Noack, 1899, *Zool. Anz.*, 22: 13.

*Capra hircus nubiana* F. Cuv., Schwarz, 1935, *Ann. Mag. Nat. Hist.*, 16: 435.

Four specimens, horns only. Collector's number 100b, ♂, Najran, July 1936, outside curve of horns 34 and 35 inches (86 and 89 centimetres). Two ♂♂, no numbers or locality, outside curve of horns 27 inches (68.5 centimetres) in one head and 22½ inches (56.5 centimetres) in the other. One ♀, no number, Jabal Tuwaig (near Riyadh), September 1936, outside curve of horns 8 and 8½ inches (20.3 and 21.6 centimetres).

### *Gazella* Blainville 1816—Gazelles.

Mr. Philby has brought back a fine series of gazelles which give a clearer understanding of the differences between the "Idmi" gazelle (*arabica*) and the "Afri" gazelle (*saudiya*), differences which are at first sight not apparent in individual specimens unless they are at the extreme ends of their variation range.

There are also specimens of the horns of the "Rim" gazelle (*marica*) in this collection, but unfortunately no skins.

The distribution of these three gazelles is interesting. This is what Mr. Philby writes: "Idmi *passim* in all suitable country, i.e. valleys of foothills, open rock or sand plains and in true sand areas (nufud), but not so plentiful in sand tracts as elsewhere. Afri confined (?) to sandy plains and overlapping into sand areas. Rim only in sand areas and fringes of sandy plains near them." So from "idmi" to "rim" represents a progressively more barren habitat, and this is correlated with an increase in horn length from the former to the latter (see Pl. VI). It seems to be only partly correlated with a lightening of coat colour because though "afri" is lighter than "idmi" yet "rim" has a darker body<sup>2</sup> colour than "afri."

I have avoided following Pocock and Schwarz in calling the Arabian gazelles subspecies of *Gazella gazella* because though *arabica* and *saudiya* may often be seen on the same ground they appear to be distinct animals and the herds (of from 4 to 20 individuals) seem never to mix. Further, such a procedure would not express the inter-relationships of the Arabian gazelles as I see them. I have left the question of subspecies open for the moment and have called each form a species in an arbitrary manner.

The following is my interpretation of the available material: *saudiya* is related to *arabica*, the former being a desert form and the latter a not-so-desert form; *marica* bears the same relationship to *muscatensis*. These two latter gazelles show the lyrate shape of horn in the ♂♂ which is lacking in the two

<sup>1</sup> Philby *in litt.*, 21.vi.1937.

<sup>2</sup> "Rim" has, however, a paler face than "afri."



former, and *marica* has longer and more slender horns than *muscatensis* in the same way that *saudiya* has longer and more slender horns than *arabica*. There is, however, a ♂ gazelle (B.M. 34. 8. 4. 29), collected by Bertram Thomas at Jurbaib, which is intermediate between *arabica* and *muscatensis* so far as the horns are concerned.

The only other Arabian gazelles I have seen are from Aden. The horns of these ♂♂ are much shorter, stouter and straighter than those of *arabica* illustrated in Lichtenstein's and in Hemprich & Ehrenberg's plates and than Philby's specimens, and I do not quite agree with Pocock (1935A) who, considering the skins only, said that he did not think the Aden specimens were sufficiently different from the typical ones to merit subspecific rank. I am not at all sure that Neumann's name *erlangeri* should not stand for the Aden specimens.

It is to be hoped that more specimens of Arabian gazelles will be collected, more especially of *marica*, and that no time will be lost. Motor-cars and modern rifles are pressing hard on these animals and they may soon be wiped out.

#### 4. *Gazella arabica* Hempr. et Ehrenb.

*Antilope arabica* Hempr. et Ehrenb., M. H. C. Lichtenstein 1827-1834 (1827), *Darstellung Säugethiere*, pl. vi and text, type loc.: East coast of Red Sea.

*Antilope arabica* Hemprich et Ehrenberg 1828 (pl. 1828, text 1833), *Symbolae Physicae Mammalium*, 1: folio r verso.

17 ♂♂ and 2 ♀♀ from western and southern Arabia.

Native name—"idmi." Hemprich & Ehrenberg have a note: "*Striatam* Antilopam, quam Arabum scriptores et Lexicographi *Adm* vel *Idma* vocant et ex cuius nomine Shaw *Lidmeae* nomen male fabricasse videtur (nam *el Idma Lidma* pronuntiarum solet), ad nostram Antilopam arabicam spectare, nullus dubito." On the other hand, native names of gazelles should be regarded with suspicion. For instance, the Atlas Gazelle (*G. cuvieri* Ogilby) is also known as "edmi" and Lichtenstein says that the natives call *arabica* "ariel." Moreover, in Arabia there seems to be some confusion between the names "afri" and "rim" (see under *saudiya* and *marica*), and Loder's Gazelle (*G. leptoceros loderi* Thos.), a Tunisian form, is also known as "rim."

There has been some difference of opinion as to the type locality of *arabica*. Lichtenstein, who first published the name from Hemprich & Ehrenberg's manuscript says: ". . . östliche Küste des rothen Meers . . . Sie bewohnt dort die Vorhöhen in der Nähe der Küste und findet sich sogar auch auf den derselben nahe liegenden grösseren Inseln, z.B. auf der . . . Insel Farsan." Since no restricted locality is mentioned by name save Farsan, some writers have taken this as the type locality. But Lichtenstein does not emphasize this island more than the mainland, and when we turn to Hemprich & Ehrenberg we find: ". . . ex vallibus sinaiticis, Arabia deserta littorali, et ex insula Maris Rubri Farsan, Arabiae felicis urbi Gisan proxima." The plate which goes with this text has "Sinai" on it, so some writers have taken this to be the type locality. In the absence, however, of any evidence as to which skin the original description was based on there seems little point in trying to pin down the type locality any closer than "east coast of the Red Sea."

Mr. Philby's fine series shows considerable variation in coat colour and in shape of horns, and with this new material before me I am unable to agree with

Pocock (1935A, p. 460), who believed that the differences which he observed were seasonal.

The dorsal colour is a sandy brown with a slaty tinge, the hairs being grey at the base. The flank band is variable, being a dark brownish slate in some and in others only slightly darker than the dorsal colour; there are intermediate conditions. Not only are these variations apparently unconnected



Histograms of two skull characters of adult ♂♂ of *Gazella saudiya* and *G. arabica*.

with seasonal change, but I am unable to correlate them with sex, age or locality.

The horns of the ♂♂ are very variable, some being stoutly built, short and strongly sigmoid, and others being relatively long and straight (see Pl. VI). Some of the horns are like those of *G. saudiya* ("afri"), but contrary to what might have been expected this similarity is not always found in the specimens with the lightest coloured coats. In the plate which accompanies the description of *saudiya* the authors have selected the shortest, stoutest and most hooked horns to illustrate *arabica* and the longest, most slender and straightest to illustrate *saudiya*, thereby giving the impression that the two forms can be easily distinguished by their horns which, as stated above, is not always the case.

The following characters, however, serve to distinguish these two forms :

♂ skulls.

*G. arabica*

1. Premaxilla does not make a long junction with nasal (*text-fig.* 126 A).
2. Width of combined nasals usually greatest at proximal end.
3. Breadth across the bases of the horn-cores (*text-fig.* 126 B and the histogram) 62.2–69.0 mm.
4. Larger, heavier skulls, condylobasal lengths 171–190.5 mm. (*see the histogram*).

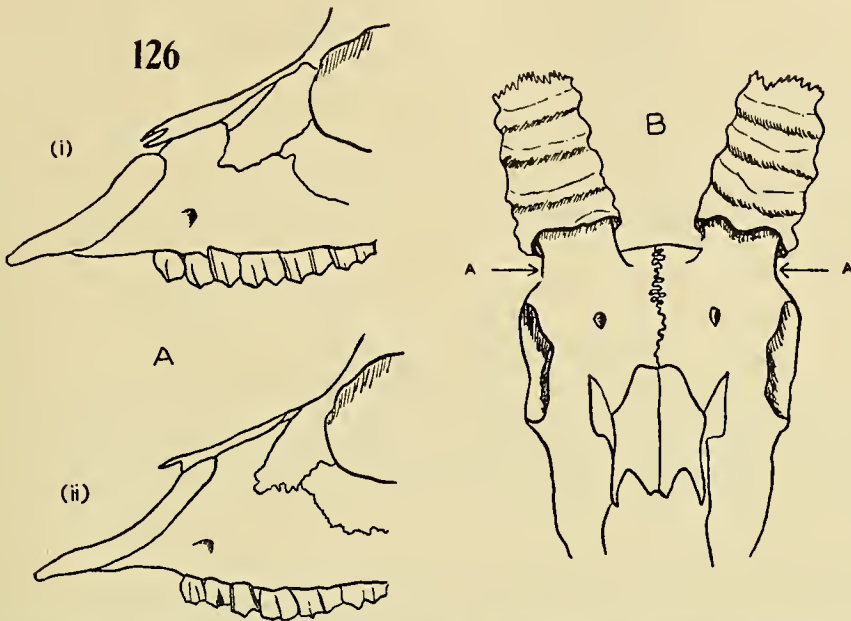
*G. saudiya*

1. Premaxilla makes a long junction with nasal.
2. Width of combined nasals usually greatest at distal end.
3. Breadth across the bases of the horn-cores 53.3–60.7 mm.
4. Smaller, lighter skulls, condylobasal lengths 166–173 mm.

♀ skulls.

5. Horns have sigmoid curve of the males. Length in a straight line about 100 mm.

5. Horns either straight<sup>1</sup> or with a scimitar-like backward curve. Length in a straight line 200-250 mm.



TEXT-FIG. 126.—(A) The rostral regions of the skulls of (i) *Gazella arabica* and (ii) *G. saudiya*. (B) The character referred to in the text as “breadth across the bases of the horn-cores” is indicated by A-A.

Skins (both sexes).

It is difficult to distinguish between *saudiya* skins and those skins of *arabica* which have the flank band almost absent, as in these cases the tips of the hairs are the same colour. But the bases of the hairs are still different :

*G. arabica*

Bases of hairs smoky to slate.

*G. saudiya*

Bases of hairs lighter than in *arabica*, greyish pink or pinkish sandy to pinkish slate.

Mr. Philby tells me that these two forms are easily distinguished by coat colour in the field. Presumably in life the hairs stand out in such a way as to expose the bases somewhat.<sup>2</sup>

<sup>1</sup> The horns of ♀ *saudiya* are used by Arab women as hair curlers.

<sup>2</sup> Since this was written I have received a letter from Mrs. Dickson at Kuwait, who had been told the following by a Badawin. “Rhim” is the biggest and most handsome of the gazelles and their meat is the best to eat. The face has white cheeks with a band of sandy red going down the centre of the face and merging into a black nose. The horns are not very long. Two other gazelles are : “Idmi,” which is reddish in colour with less white on the belly and “Afri,” which is the smallest of the lot. These three are distinguished by their colour and size, as the length of the horns and ears in each are similar.



Measurements of skulls of adult ♂ *Gazella arabica* :

Number.	Locality.	Condylobasal length.	Zygomatic breadth.	Horns (straight line).	Breadth across horn-cores at bases.
A	Rakba Plain (?)	187.5	80.4	238	65.3
B	Rakba Plain (?)	—	81.4	241	65.6
12	Rakba Plain	174.5	81.8	210	64.9
13	Rakba Plain	171	77.5	237	62.2
14	Rakba Plain	188.5	84.0	200	69.0
15	Rakba Plain	—	80.1	230	65.2
35	Dhalm	179.5	82.5	256	65.9
70	Hudhaiyib al Aranib	183	84.0	204	65.2
123	Taraf al Ain	182.5	81.8	252	62.5
128	Uqla Plain	190.5	86.7	221	68.8
130	Haraj Plain	177	80.3	224	64.1
138	Sudaihat	182	82.1	226	64.3
B.M. 69. 10. 24. 100	Mocha	183	84.5	205	64.6
B.M. 96. 12. 4. 1 <sup>1</sup>	Aden (? juv.)	—	83.8	215	60.2
B.M. 96. 12. 4. 2 <sup>1</sup>	Aden	—	—	235	66.1

5. *Gazella saudiya* Carruthers & Schwarz.

*Gazella gazella saudiya* Carruthers & Schwarz 1935, *Proc. Zool. Soc. Lond.*, p. 155, type loc. : Dhalm.

Native name—"afri." There is a certain amount of confusion as the names "rim" and also "khadhri" seem to be applied to *saudiya* occasionally. Moreover the name "rim" is also used for Loder's Gazelle, a pale-coloured, long-horned form from N. Africa. For the true "rim" of Arabia see under *marica* below.

Mr. Philby has sent six ♂♂ and nine ♀♀ from Dhalm, Jau al Khudaif, Taraf al 'Ain, Sirr al Yamani, W. Markha, Ruwaik Tract, 'Alam Abyadh and 'Arq Abu Da'ir.

The ♂♂ are hard to distinguish from those ♂♂ of *arabica* which have the flank band obsolescent and have long horns. For the characters which may be used to separate *saudiya* from *arabica* see above under *G. arabica*. The ♀♀ are easily distinguished by the fact that they have horns at least twice as long as those of ♀ *arabica*.

6. *Gazella marica* Thos.

*Gazella marica* O. Thomas 1897, *Ann. Mag. Nat. Hist.*, **19**: 162, type loc. : Nejd, Central Arabia ; Lydekker & Blaine, 1914, *Cat. Ungulate Mamm.*, **3**: 60 ; Cheesman, R. E., 1920, *J. Bomb. Nat. Hist. Soc.*, **27**: 343 ; Pocock, R. L., 1935, *Ann. Mag. Nat. Hist.*, **15**: 463.

Native name—"rim." To this species I assign a ♂ frontlet complete with horns (Pl. VI, fig. 14) which Mr. Philby found half buried in sand at Afalil on 30 September, 1936, collector's number 136, and also several odd horns without locality.

The identification of this species is not easy because the type is an immature ♂ and the only mature ♂ which Thomas saw had its horns sawn off leaving stumps 100 mm. long ; the ends were missing. However, Dr. Jayakar, who sent the type to Thomas, described it as a "reem" gazelle, which agrees with the name "rim" supplied by Mr. Philby, but what is more important the proximal 100 mm. of the horns of Philby's specimen agree well with those of the sawn-off horns.

Philby's horns are lyrate in shape and the mean length (measured along the outside of the curve) of the two horns of the Afalil specimen is 336 mm. Thomas

<sup>1</sup> Frontlets only.

had estimated that the horns of the sawn-off specimen would have been about 250 mm. long on the outside of the curve, but too much attention need not be paid to this seeing that he had never seen an adult head complete. The distance between the tips of the horns of the Afalil specimen is 93 mm. and the maximum outside breadth of the "lyre" is 174 mm.

**Lepus L.—Hares.**

Twenty-three hares (in addition to those sent on previous occasions) from south-west Arabia.

The Arabian hares have affinities with those of Egypt and are quite different from those of Syria, Palestine and Persia, which are larger animals with darker coloration and longer fur and have the characteristic "long hairs," which protrude far beyond the general coat, much more pronounced; these hairs are usually absent from Egyptian specimens and always from Arabian ones.

The zoogeographical affinities of the hares are thus different from those of the foxes (*Vulpes vulpes*), which seem to be more closely related to those of southern Persia, Baluchistan and India than to Egyptian foxes.

Arabia produces three hares, a sandy-coloured one and two dark ones, the first being found in very barren country and the last two in not-so-barren country. The particular interest of this latest collection is that it contains seventeen specimens of one of the dark forms which I have little hesitation in referring to *Lepus arabicus arabicus*.

**7. *Lepus arabicus arabicus* Hempr. et Ehrenb.**

*Lepus arabicus* Hemprich & Ehrenberg 1830 (1833), *Symbolae Physicae Mammalium*, 2: folio r recto, type loc.: "Ex Arabia Deserta prope Gumfudam<sup>1</sup> et ex Arabia Felici prope, Loheiam"; Yerbury & Thomas, 1895, *Proc. Zool. Soc. Lond.*, p. 555; Thomas, 1900, *Proc. Zool. Soc. Lond.*, p. 104.

Seventeen<sup>2</sup> specimens from that part of the west coast hill-country which lies between latitudes 16°–22° N.

There is a curious feature in some of these hares, particularly No. 42, a ♀ from Shariya, 17 September, 1934. The hairs of the back are worn in places and some of these patches are rust-coloured. The unworn hairs are not rust-coloured at any point along their length. Perhaps Hemprich and Ehrenberg are alluding to this when they say: "vellere cinereo aut fulvescente nigro rufoque variegato."

The following are the measurements in millimetres of six adult ♂♂ and seven adult ♀♀ of *arabicus*:

	Extremes.		Average.		Standard deviation.	
	♂	♀	♂	♀	♂	♀
Head and body (collector's) . . . . .	338 –410	323 –402	381	368	24.6	25.6
Hindfoot (in skin) . . . . .	89.5– 99	86.5– 97.5	94	91	3.3	3.6
Ear (in skin) . . . . .	91 –118	87 –112	105	101	9.6	8.1
Skull (over all) . . . . .	76.3– 83.7	78.9– 82.6	80.4	80.7	2.4	1.2

<sup>1</sup> The modern spelling of Gumfuda is Qunfidha.

<sup>2</sup> Mr. Philby has sent an extra specimen, ♀, number 151, from Wadi Luwai (25° 0' N. 40° 39' E.) dated 22. v. 1938. Head and body 388, hindfoot 90, ear 110 millimetres. Skull broken.

I am not sure whether *L. omanensis* Thos.<sup>1</sup> should not be regarded as a race of *arabicus*. Thomas says of *omanensis*: "This interesting little hare is at once distinguished from all other allied members of the genus by its slender proportions and its extremely small size. Its hindfoot is nearly an inch less than in any species described by Hemprich & Ehrenberg. . . ." With regard to Thomas's statement about the hindfoot Hemprich & Ehrenberg give 4 German inches as the "planta" measurement for *arabicus*, and this is only 16 mm. longer than Thomas's measurement for *omanensis*. Further, it is probable that Hemprich & Ehrenberg included the claws which Thomas did not. The type of *omanensis*, a ♀, B.M. 94. 3. 9. 36, has head and body 360, hindfoot 89, and ear 99, all of which measurements fall within the limits of the above specimens collected by Mr. Philby.

The skull of the type of *omanensis* does seem on the small side with an over-all length of 74.5 mm. This may be due to a sub-adult condition and I should like to see more specimens; only three have been recorded so far.

### 8. *Lepus arabicus cheesmani* Thos.

*Lepus omanensis cheesmani* Thomas 1921, *J. Bombay Nat. Hist. Soc.*, 28: 28, type loc.: Dohat al Salwa; Pocock, 1935, *Ann. Mag. Nat. Hist.*, 15: 445.

Though it is an open question whether *omanensis* should be regarded as a race of *arabicus* or not, it is now clear that *cheesmani* is a desert form of the latter. The transition from the dark igneous formation of the west coast to the light sandstone of the interior is quite abrupt and along the dividing line are found the lighter coloured of the *arabicus* and the darker of the *cheesmani*.

Six specimens. The following are the measurements in mm. (the head and body length was taken in the flesh, and the hindfoot and ear in the skin):

			Head and body.	Hindfoot.	Ear.	Skull (over all).
O <sub>3</sub> O <sub>4</sub> +O <sub>5</sub> +O <sub>6</sub>	109	Wadi Khabb 4,200 ft.	386	93½	110½	82.5
	110	Wadi Khabb 4,200 ft.	328	85	84½	68.3
	90	Husainiya 4,000 ft.	362	85	111	81.0
	91	Husainiya 4,000 ft.	423	90	99	81.4
	116	Mushainiya 3,700 ft.	360	96	113½	—
	Type	Dohat al Salwa	380	84	94	70.5 <sup>2</sup>

Mr. Philby's number 90 (killed in June) agrees with the type (killed in March) save that it is a little pinker<sup>3</sup> and has larger ears. Number 109 (killed in July) is similar. Number 110 (killed on the same day as 109) is pure sandy-coloured with none of the buff of the type and numbers 91 (killed in June) and 116 (killed in August) are pink-sandy.

So these hares seem variable not only in ear and hindfoot length, but also in colour. These specimens fit in well, however, with those which Mr. Philby has sent from other parts of Arabia and which have been discussed by Pocock (1935, p. 445).

<sup>1</sup> O. Thomas 1894, *Proc. Zool. Soc. Lond.*, p. 450, type loc.: Ziki in Oman.

<sup>2</sup> This is Thomas's measurement—I make it 71.1.

<sup>3</sup> Buxton (1923, p. 146) mentions seeing a pinkish buff hare at Qazvin in N.W. Persia.



### 9. *Jaculus jaculus* L.—Jerboa.

*Mus jaculus* Linnaeus 1758, *Syst. Nat.*, ed. x, p. 63, type loc.: "Aegyptus, in montibus Aegyptum ab Arabia dividitibus"—see Hasselquist, *Acta Scientiarum Upsaliensis*, 1744–1750 (1751), p. 17.

Mr. Philby has sent seventeen specimens, numbers 78–84 from Raushan and 73–76 from Dailami (both in Wadi Bishe), 58–60 from Rass (N.W. of Riyadh), 113–114 from Matau (S.W. Rub al Khali) and number 13 from Jidda.

The more I look at these jerboas the more difficult it becomes to decide what to call them. The types of *J. florentiae* Cheesman & Hinton 1924, from Jabrin, *J. f. oralis* of the same authors, from Koweit, and *J. loftusi* Blanford 1876, from near Basra, can all be lost among the Raushan specimens alone.

These animals seem to be very variable and I can find no constant features in the skins or the skulls. Their general dorsal colour varies from ashy-buff to sandy with a pinkish tinge. The only remarks I can make are of a general nature; the Matau specimens are on the whole perhaps a little yellower than the Raushan and Dailami ones and the Rass specimens are on the whole rather darker (though the darkest Raushan specimens are as dark as the Rass ones). The Jidda specimen is an exact match of the type of *J. loftusi*.

*Jaculus jaculus* is very plastic so far as colour is concerned and turns up pale in very desert areas and dark in not so-desert-areas. For instance, the type of *J. j. airensis* Thomas & Hinton 1921, from the Air Mts. in French West Africa, is strikingly like the type of *J. florentiae* and specimens collected by W. Rutledge in Kordofan in 1929. These localities are widely separated and there are darker forms of jerboa in the intervening country.

The pale and dark forms of *Jaculus jaculus* are not distributed according to conventional ideas of geographical races, but have a mosaic distribution. The conventional system of according separate names to each separated group overlooks this fact and has led to far too many descriptions.

### 10. *Acomys dimidiatus* Cretz.—Bicoloured Spiny Mouse.

*Mus dimidiatus* Cretzschmar in Rueppell 1826 (1827), *Atlas Reise Nördl. Afrika*, Pt. 1, p. 37, type loc.: Sinai.

*Acomys dimidiatus* Cretz., Sundevall, 1842 (1843), *K. Svenska Vetensk. Akad. Handl.*, p. 222.

One specimen, collector's number 168, ♂, Harra Rahat, 4,000 ft., 19 November, 1938. Head and body 103, tail missing, hindfoot 18, ear 19, total length of skull 30.4, condylobasal length 28.2, zygomatic breadth 14.2, maxillary alveoli 4.7, mandibular length 14.6.

### 11. *Acomys russatus* Wagner—Golden Spiny Mouse.

*Mus russatus* Wagner 1840, *Abh. Bayer. Akad. Wiss.*, 3: p. 195, pl. 3, fig. 2, type loc.: Sinai.

Three specimens from the Najran district. Number 142 is the same colour as the specimen depicted in Wagner's plate,<sup>1</sup> but the other two are darker, i.e. they have more grey-brown about them. Also a specimen (♀?) from 'Aqda, near Hail, number 154, June 1938.

These specimens extend the range of *russatus* in a southerly direction, no specimens having previously been recorded from peninsular Arabia. Thomas described *Acomys dimidiatus homericus* from El Khaur, Aden (*Ann. Mag. Nat. Hist.* 12. 1923. 173), but *russatus* is quite distinct. The latter has a relatively

<sup>1</sup> The British Museum's copy.

small skull, the tail is shorter than the head and body and the belly is a dirty grey, whereas *homericus* has a larger skull, the tail is 10–20 mm. longer than the head and body and the belly is white.

Mr. Philby's notes say, "Skulking among granite rocks"; the measurements in mm. are :

Collector's number.	Sex.	Locality.	Head and body.	Tail.	Hind-foot.	Ear.	Total length of skull.	Condylobasal length.	Zygomat. breadth.	Mandibular length.	Date.
142	♂	Hadhba	100	62	17	15½	26·8	—	13·2	14·7	10 Oct., 1936
144	♂	Shaib Arjan	106	57	16	18	26·4	—	—	14·4	5 Nov., 1936
208	♂	Najran	111	64	17	16½	28·2	26·0	14·0	15·0	22 Oct., 1936

### 12. *Rattus rattus* L.—Rat.

Two specimens. Collector's number 1, ♀, Jidda, 27 January, 1934, and number 86, ♂, from Suda Village, near Abha, 9 June, 1936. The skull of number 86 was too damaged to preserve.

These rats are not *R. r. flaviventris* or *R. r. frugivorus*, but may be *R. r. alexandrinus*. The dorsal surface is grey-brown in both and the belly of number 86 is grey with a cinnamon wash, whereas the belly of number 1 is grey-white.

### 13. *Psammomys obesus diana*e subsp.n.—Miss Philby's Fat Sand-rat.

*Type locality*.—Dailami, 20° 20' N. 42° 40' E., 3,900 ft.

*Type*.—Adult ♂, collector's number 77, 26 May, 1936, in the British Museum.

*Paratypes*.—Juv. ♀, collector's number 10, Samuda, 21 June, 1934. Juv. ♂, collector's number 36, Jidda, 28 August, 1934. Adult ♀, collector's number 63, Dawadami, 9 March, 1935. Adult ♂, collector's number 71, Dailami, 26 May, 1936.

*Description*.—Pale ashy sandy colour; rusty yellowish tinge dorsally, strongest on head and after-end of back; yellowish tinge on the flanks. Yellow patch on the shoulders. Belly greyish white with a tinge of yellow on the middle line. Feet, hands and tail pale ashy sandy; tip of tail pencilled on the dorsal side only—pencil black.

Paler than *P. obesus* Cretz.<sup>1</sup> and *P. terrae-sanctae* Thos., 1902 (type loc.: Dead Sea); rather paler even than *P. vexillaris* Thos., 1925 (type loc.: Bondjem, Tripoli).

*Measurements* in mm.—Considerably smaller than *P. terrae-sanctae*. Type: head and body 133, tail 118, hindfoot 34, ear 14, condylbasal length 34·50, zygomatic breadth 20·65, maxillary tooth row (alveolar length) 6·24, diastema (upper) 10·21, interorbital width 6·14, nasals (maximum length) 14·10, depth of rostrum at level of anterior end of tooth row 10·06, mandibular length 20·46, greatest diameter of bulla 14·00 (this last measurement was taken from number 71, since the bullae of the type are missing).

### *Meriones* Illiger 1811—Jirds.

These are rat-like animals about 250–300 mm. (10–12 inches) long, about half of which are tail. They are mostly "desert-coloured" and the tip of

<sup>1</sup> Cretzschmar in Rüppell, *Atlas zu der Reise im nördlichen Afrika—Säugethiere*, 1826 (1828). Type loc.: Alexandria.

the tail has a dark brush. The hind legs are not modified for jumping as in jerboas.

The following forms have been described from Arabia :

1. *M. longifrons* Lataste 1884 (type loc. : Jidda) is a smallish form, medium pale.

2. *M. buryi* Thos. 1902 and *M. rex* Yerbury & Thomas 1895, both from Aden, are very dark forms.

3. *M. pelerinus* Thos. 1919 (type loc. : Tebuk, on the Hedjaz railway) has very much enlarged bullae. Aharoni (1932, p. 197) makes this species a synonym of *M. crassus* Sundevall 1842, described from Sinai.

4. *M. arimalius* Cheesman & Hinton 1924 (type loc. : Jabrin) is the palest of all the Arabian Jirds.

5. *M. ismahelis* Cheesman & Hinton 1924 (type loc. : Hufuf) is a pale form with very large bullae like *pelerinus*.

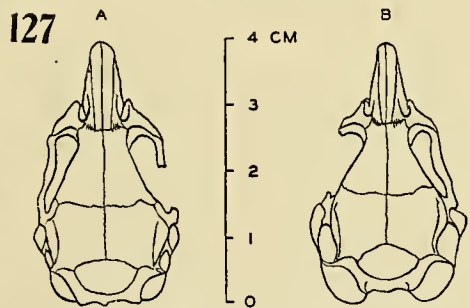
6. *M. erythroura edithae* Cheesman & Hinton 1924 (type loc. : Khudud Spring, Hufuf) is a darkish form with a reddish brown tail. For *M. erythroura evelynae* of the same authors see below under *M. erythroura edithae*.

The character of the large bullae is shown in text-fig. 127. (A) shows a form with small (comparatively speaking) bullae and (B) shows a form with larger bullae which project well beyond the occipital region of the skull.

**14. Meriones erythroura<sup>1</sup> edithae** Cheesman & Hinton—Edith Cheesman's Jird.

*Meriones syrius*<sup>2</sup> *edithae* Cheesman & Hinton 1924, *Ann. Mag. Nat. Hist.*, **14** : 555, type loc. : Khudud Spring, Hufuf ; Cheesman, 1926, *In Unknown Arabia*, p. 360 (a reprint of the original description with additional matter).

Thirteen specimens. Those from Riyadh and Khufaiyya, and some of those from Shari Wells, closely resemble *edithae*, though their tails are not quite so long<sup>3</sup> (the description says that the tails of *edithae* are "ochraceous salmon," but I prefer to describe them as reddish brown ; I have examined the original series and I can see no salmon about them). The rest of the Shari Wells specimens exactly match the paler-coloured form *M. syrius evelynae*<sup>4</sup> Cheesman & Hinton, but it is significant that these specimens are not fully grown. The skulls of the type and paratypes of *evelynae* have the basi-occipital/basi-sphenoid suture still visible as have the pale coloured Shari Wells specimens, but the type of *edithae* and the darker Shari Wells specimens have this suture obliterated. With this in mind and the fact that



TEXT-FIG. 127.—(A) *Meriones erythroura edithae*, collector's number 163, Shari Wells. (B) *M. ismahelis*, collector's number 158, Shari Wells.

<sup>1</sup> *Gerbillus erythroura* Gray 1842, *Ann. Mag. Nat. Hist.*, **10** : 266, type loc. : Afghanistan.

<sup>2</sup> *Meriones syrius* Thomas 1919, *Ann. Mag. Nat. Hist.*, **3** : 268, type loc. : Karyatein.

<sup>3</sup> The type of *edithae* has head and body 143 and tail 181, and the largest of Mr. Philby's specimens has head and body 162 and tail 173, so it may be that the longer tail of the former is due to differences in styles of measurement and making up.

<sup>4</sup> *Meriones syrius evelynae* Cheesman & Hinton 1924, *Ann. Mag. Nat. Hist.*, **14** : 555, type loc. : Khorosan Spring, Hufuf.



the Shari Wells specimens were all caught on the same day (see the table of measurements) it looks as though *evelynae* turns into *edithae* with age.

The following are the measurements in millimetres :

*Meriones erythroura edithae*

Sex.	Collector's number	Locality.	Date.	Head and body.	Tail.	Hind-foot.	Ear.	Total length skull.	Condy-lobasal length.	Zygo-matic breadth	Max. diam. bullae.	Maxillary alveolae.	Mandibular length.
	43	Riyadh	27. ix. 1934	136	161	34	17	—	—	21.4	—	6.4	20.5
	49	Khufaifiya	13. xi. 1934	160	162	39	21	—	—	—	—	—	—
	50	Khufaifiya	14. xi. 1934	162	173	37	21	42.2	39.0	—	16.5	6.8	22.1
	51	Khufaifiya	14. xi. 1934	148	140	34	18	40.2	37.2	21.8	15.3	6.6	20.1
	155	Shari Wells	4. vi. 1938	148	156	38	17	—	—	—	—	5.7	16.5
	156	Shari Wells	4. vi. 1938	150½	149	36	19	—	—	23.0	—	6.9	21.8
	157	Shari Wells	4. vi. 1938	132	145½	37	18	—	—	20.5	16.0	6.4	—
	159	Shari Wells	4. vi. 1938	128½	142	33	17	—	—	19.1	—	5.8	18.8
	160	Shari Wells	4. vi. 1938	111	122	32½	14	—	—	—	—	5.6	16.4
	161	Shari Wells	4. vi. 1938	111	117½	32½	17½	—	—	21.2	16.1	5.6	—
	163	Shari Wells	4. vi. 1938	149	147	35	19	37.6	34.3	—	15.2	6.0	18.6
	164	Shari Wells	4. vi. 1938	135	138½	35	15	39.4	36.5	22.3	15.6	6.4	20.3
	165	Shari Wells	4. vi. 1938	98	111	32	14	30.8	27.7	16.5	12.3	5.4	15.4

15. *Meriones ismahelis* Cheesman & Hinton—Nocturnal Jird.

*Meriones ismahelis* Cheesman & Hinton 1924, *Ann. Mag. Nat. Hist.*, **14**: 553, type loc.: Hufuf Oasis; Cheesman, 1926, *In Unknown Arabia*, p. 357 (a reprint of the original description with additional matter).

Two specimens from Shari Wells, 4 June, 1938. Collector's number 158, ♂, head and body 111, tail 120, hindfoot 29, ear 16, total length skull 36.9, maximum diameter of bullae 16.4, maxillary alveolae 5.4, mandibular length 17.5 millimetres. Collector's number 162, ♂, head and body 111, tail 122, hindfoot 31, ear 16½, maxillary alveolae 5.5, mandibular length 17.6 millimetres.

*Dipodillus* Lataste 1881—Gerbils.

The systematics of the Arabian gerbils of this genus are in a rather unsatisfactory condition, so a few notes on some of them may be useful.

*D. dasyurus* Wagner 1842, *Arch. Naturgesch. Berlin*, Jahrg. **8**, Bd. 1, p. 20, type loc.: West coast of Arabia.

Wagner gives "Schwanz 3<sup>u</sup> 0<sup>m</sup>" but Thomas, who inspected the type, has "Tl. (c) 100" (in MS.). Since Miss Aharoni (1932, p. 206) says that the tail of the type is broken, I take it that Thomas's MS. note means that the tail must originally have been about 100 mm. long: that is, about 4 inches. So it looks as though Wagner had overlooked the fact that the tail was broken when he described it as being as long as the head and body, and this has led to confusion. As a matter of fact *dasyurus* has the tail considerably longer than the head and body and with a good pencil. The name *dasyurus* suggests a rough-haired tail but *poecilops* has a rougher tail. The bullae in *dasyurus* are relatively small.

*D. famulus* Yerbury & Thomas 1895, *Proc. Zool. Soc. Lond.*, p. 551, type loc.: Lahej.

This species has very large ears and a very long tail, with a much bushier pencil than the other Arabian *Dipodillus*. The bullae are large and when viewed

dorsally project backwards beyond the foramen magnum, though perhaps not quite so markedly as in *D. arabium*.

*D. lixa* Yerbury & Thomas 1895, *Proc. Zool. Soc. Lond.*, p. 550, type loc. : Shaik Othman.

Not a satisfactory species : based on immature specimens. The authors say that the type is "a slightly immature ♀." I have examined the skull and would not have qualified the word "immature." The teeth of gerbils present an adult appearance very early, even at irruption, due to the fact that the crowns of the molars have little or no enamel on them at the apices of the tubercles.

*D. mimulus* Thomas 1902, *Ann. Mag. Nat. Hist.*, 9 : 362, type loc. : Lahej.

This species bears a strong resemblance to *poecilops*, but is considerably smaller.

### 16. *Dipodillus arabium* Thos.—Arabian Gerbil.

*Dipodillus arabium* Thomas 1918, *Ann. Mag. Nat. Hist.*, 2 : 61, type loc. : Tebuk, Hedjaz Railway.

One specimen, collector's number 12, ♀, from Ashaira, 4,000 ft., 21 March, 1934. The tail is browner than that of the type and the tail-pencil is a little fuller, but not so full as in *famulus*. Otherwise there is good agreement. Measurements in mm. : head and body 95, tail 125, hindfoot 25, ear 14, over-all length of skull 29.4, condylobasal length 26.1, maximum diameter of bullae 12.0, diastema 7.4. The bullae are large and in dorsal view project backwards beyond the foramen magnum.

### 17. *Dipodillus poecilops* Yerbury & Thos.—Spiny-tailed Gerbil.

*Dipodillus poecilops* Yerbury & Thomas 1895, *Proc. Zool. Soc. Lond.*, p. 549, type loc. : Lahej.

Three specimens from Hadda. ♂, collector's number 8, 2 March, 1934, and ♂, No. 66 and ♀ juv., No. 67, 15 Feb., 1936. These have pencil-less tails with spiny hairs. The bullae, viewed dorsally, do not project backwards beyond the foramen magnum.

### 18. *Gerbillus arduus* Cheesman & Hinton—Jafura Gerbil.

*Gerbillus arduus* Cheesman & Hinton 1924, *Ann. Mag. Nat. Hist.*, 14 : 551, type loc. : Jafura.

The following skins and skulls were collected by Mr. Philby :

120	♂	Ramlat Sab'atain . . . .	7.viii.1936
124	♂	Ras al Khabb . . . .	19.ix.1936
125	♀	Sahlal . . . .	20.ix.1936
126	♂	Sahlal . . . .	20.ix.1936
135	—	'Arain . . . .	30.ix.1936

These specimens agree well with the typical series and extend the known range of the species in a south-southwesterly direction. Pocock (1935, p. 444) mentions a specimen from Hawiya some 180 miles south of the type locality, but the above specimens come from localities some 650 miles from Jafura and on the opposite side of the Rub al Khali.

**Tatera** Lataste 1882.

Wroughton (*J. Bombay Nat. Hist. Soc.*, **25**: 1917: 40) made a new genus, *Taterona*, for the African gerbils formerly included in *Tatera*. He distinguished the two genera as follows:

*Tatera*.—Tail dark above and below with a light-coloured stripe along each side of it and the vertical part of the parieto-squamosal suture about the same length as the anterior horizontal part thereof.

*Taterona*.—Tail dark above and pale below (save in *nigricauda* which has an entirely black tail) and the vertical part of the parieto-squamosal suture about a third the length of the anterior horizontal part thereof.

Wroughton gave other characters besides, but admitted that they were not constant. Mr. Philby's specimens are of great interest in that according to the shape of the parieto-squamosal suture they would be put into *Tatera*, while according to the tail character they belong to *Taterona*. Hollister (*Bull. U.S. Nat. Mus.*, **99**: 1919: 28) has indicated that he does not consider *Taterona* a good genus and the above specimens, coming from a country where Indian and Ethiopian elements meet, provide a good link between *Tatera* and *Taterona*; I intend to drop the latter name.

**19. Tatera philbyi** sp.n.—Philby's Gerbil.

*Type*.—Adult ♀, collector's number 95, Najran (17° 30' N. 44° 20' E.) 4,400 ft., 29 June, 1936, skin and skull.

*Paratypes*.—♀, collector's number 38, Taif, 6 September, 1934; ♀, number 67, Ashaira, 5 May, 1936; ♂, number 72, Dailami, 26 May, 1936; ♂, number 85, Shaib Hanjur, 2 June, 1936; ♀, number 93, Najran, 26 June, 1936.

*Description*.—General colour olivaceous buffy brown, head and spine rather warmer tone than rest of back. Hairs of the back about 10 mm. long, basal two-thirds slate-coloured, terminal third buffy brown, some tipped with black. Under-parts dirty white with a yellow tinge in places. Hands, feet, ears and dorsal surface of tail same colour as spine, ventral surface of tail lighter. The skull is much like that of Persian and Indian specimens of *Tatera*.

*Measurements*.—Type: head and body 153, tail 157, hindfoot 36, ear 19, condylobasal length 37.1, zygomatic breadth 21.0, greatest length and breadth of combined nasals 16.7 × 4.7, anterior palatal foramina 7.1, upper diastema 10.4, crowns M<sup>1-3</sup> 5.4. The type is not the largest of the series. Paratype: number 85, head and body 162, tail 160, hindfoot 38, ear 21, condylobasal length 40.9. This specimen, though larger than the type, was rejected because the hairs of the back are badly worn.

*Discussion*.—*Tatera philbyi* is easily distinguished from neighbouring species by the fact that the latter have dark tails with a light stripe down each side, whereas *philbyi* has the tail dark above and light below. The two nearest neighbours are *T. taeniura* Wagner 1843, described from Syria, and *T. bailwardi* Wroughton 1906, type locality Karun River. *T. philbyi* is decidedly smaller than *T. taeniura* and slightly smaller than *T. bailwardi*. The nearest African form is *T. robusta* Cretz. 1830/31, described from Kordofan. This form is about the same size as *philbyi* but lacks the olivaceous tinge of the latter and has the belly almost pure white. Moreover there are differences between the skulls of *robusta* and *philbyi*.



**20. Caracal caracal** Müll.—Caracal Lynx.

*Felis caracal* Müller <sup>1</sup>1776, *Natursyst. Suppl.*, p. 30, type loc.: “. . . en Barbarie, en Arabie & dans tous les pays qu’habitent le lion, la panthère & l’once.”

*Felis caracal* Gùldenstädt in Schreber, O. Thomas, 1895, *Proc. Zool. Soc. Lond.*, p. 548, Aden; O. Thomas, 1900, *l.c.*, p. 100, Lahej.

Native name—“ Tifa.”

A sub-adult ♀, collector’s number 39, Qaim near Taif, 5,200 ft., 7 September 1934.

The skin is a sandy cinnamon dorsally with a silvery grizzling, the total effect being a purplish-pink tinge on a sandy ground colour. The head is somewhat darker. The outside of the ear and the ear-tuft are black with a white admixture, the rim of the ear and the hairs on the inside of the ear are white. The fore- and hindlegs are the same colour as the back. The face has some white on each side of the bridge of the nose and on the lower eyelids. The throat, armpits and groins are white. The belly is the same hue as the back but several tones lighter; there are irregular cinnamon to brown spots on the chest. There are three irregular brown transverse bars on the upper inner surface of each foreleg.

Measurements in millimetres: head and body 630, tail 227, hindfoot 157, ear 74, over-all length of skull 110·7, condylobasal length 100·9, zygomatic breadth 76·2, inter-orbital width 29·3, maximum length of upper carnassial 14·35.

**21. Felis constantina** <sup>2</sup> *syriaca* Tristram—Wild Cat.

*Felis syriaca* Tristram 1867, *The Natural History of the Bible*, p. 67, type loc.: Syria.

*Felis maniculata* Cretz. in Rüppell, Yerbury & Thomas, 1895, *Proc. Zool. Soc. Lond.*, p. 547, Aden; Thomas, 1900, *ibid.*, p. 100, Lahej.

*Felis ocreata* Gmelin, Pocock, 1935, *Ann. Mag. Nat. Hist.*, **15**: 455, Umm al Qurun.

Native name—“ Hyr-Birry ” (*vide* A. G. Griffin). The classical Arabic name seems to be “ Hirr.”

Three specimens :

(a) Adult ♂ (but basi-sphenoid pre-sphenoid suture still open), collector’s number 145, ‘Iraq Well, 4,300 ft., 6 November, 1936. The spots are very indistinct. The measurements in mm. are: head and body 498, tail 390, hindfoot 131, ear 56, over-all length of skull 98·6, condylobasal length 89·9, zygomatic breadth 68·9, maximum length of upper carnassial 11·1, mandibular length 64·8.

(b) Adult ♀ shot by A. G. Griffin 15 miles north of Jidda at sea-level, 7 January, 1938. There are no flesh measurements but Mr. Griffin writes: “ It is the biggest I have seen.” The skin has the spots well developed. The skull has the occipital region missing, but the mandibular length gives a comparison with (a) and (b). The measurements in mm. are: zygomatic breadth 60·7, maximum length of upper carnassial 10·2, mandibular length 58·8.

(c) Young ♀, collector’s number 52, 15 miles N.E. of Jidda at sea-level, 1 October 1934. The skin of this kitten does not show the spots at all distinctly. Skull measurements in mm. are: over-all length 82·9, condylobasal length 74·2, zygomatic breadth 57·6, maximum length of upper carnassial 11·9, mandibular length 56·2.

It will be seen that (c) has a slightly smaller skull than (b) but that its upper

<sup>1</sup> For the authorship of *caracal* see Matschie, 1912, *S.B. Ges. Naturf. Fr. Berl.*, pp. 55–67.

<sup>2</sup> The name *constantina* (Forster 1780, *Buffon’s Naturgeschichte*, **6**: 313) has line priority over *lybica*, which appears on the same page.

carnassial is much bigger. Further, (c) has P<sup>2</sup> well developed, whereas (b) has no P<sup>2</sup>. Now (b) is by no means aged—the teeth being strong and unworn—and I can find no explanation for its comparatively small teeth. It is possible that it may be a feral form of domestic cat.

## MONGOOSES

There are three mongooses known at present from Arabia.

### 22. *Ichneumia albicauda* G. Cuv.

*Herpestes albicaudus* G. Cuvier 1829, Règne Animal, 2nd edit., 1 : 158, type loc. : Senegal.  
*Ichneumia albicauda* G. Cuv., I. Geoffroy, 1837, *Ann. Sci. Nat. Paris (Zool.)*, 8 : 251.

This is a large mongoose with coarse hair and a white tail. Head and body about 18½ inches (470 mm.), tail about 14 inches (358 mm.). It has been recorded from the Muscat district (Thomas, 1894, *Proc. Zool. Soc. Lond.*, p. 450) and may exist round Aden (Yerbury & Thomas, 1895, *Proc. Zool. Soc. Lond.*, p. 548, say : “A Mongoose was seen at Haithalhim. The white-tailed species has been recorded by Thomas from Muscat, and no doubt occurs at Aden”).

The Muscat specimens seem to have a rather more strongly bowed zygoma than the Sudan specimens I have seen, but this may be an age character. The skins are slightly darker as well, but Abyssinian skins are darker still. I have no good reason for separating the Arabian specimens from the Sudan ones in spite of their geographical separation.

### 23. *Herpestes javanicus pallipes* Blyth.

*Mangusta pallipes* Blyth 1845, *J. Asiatic Soc. Bengal*, 14 : 346, type loc. : Kandahar.  
*Herpestes persicus* Gray 1864, *Proc. Zool. Soc. Lond.*, p. 554, type loc. : Rhugistan & Mohammerah.  
*Herpestes javanicus pallipes* Blyth, Pocock, 1937, *J. Bombay Nat. Hist. Soc.*, 39 : 242.

A small mongoose, head and body about 12 inches (305 mm.), tail about 10 inches (255 mm.).

Cheesman (1920, *J. Bombay Nat. Hist. Soc.*, 27 : 332) says that this form is common from Fao to Baghdad. It may occur round Kuwait.

### 24. *Herpestes edwardsii ferrugineus* Blanf.

*Herpestes ferrugineus* Blanford 1874, *Proc. Zool. Soc. Lond.*, p. 661, pl. 81, type loc. : Larkhana, Sind.  
*Herpestes edwardsii ferrugineus* Blanf., Pocock, 1937, *J. Bombay Nat. Hist. Soc.*, 39 : 217-222.

Mr. Philby has sent one specimen from ‘Uquair, a ♂ collected on 22 August, 1938, collector’s number A.

This form is intermediate in size between *albicauda* and *pallipes*; Mr. Philby’s specimen measured (in mm.)—head and body 368, tail 371, hindfoot 69, ear 18. The skull (occipital portion damaged) measured—zygomatic width 36·8, inter-orbital width 15·0, maxillary width 14·0, mandibular length 47·3, pm<sup>4</sup> (maximum external length) 7·7, m<sup>1</sup> (maximum diameter) 7·6.

Mr. Philby tells me that these mongooses are very local, in fact he has only seen them round the customs shed down by the quay, where they eat fish, chickens, eggs, etc. This suggests that they have been introduced; they appear to be plentiful.

## FOXES

There are three species of fox in Arabia. The largest is *Vulpes vulpes arabica* Thomas. It is related to the British fox, but is smaller and paler. It has been recorded from the southern half of Arabia as far north as Riyadh, but is doubtless found all over Arabia and probably into Palestine.

*Vulpes ruppelli sabaea* Pocock is a medium-sized fox, paler than the preceding species and distinctly smaller. Not many specimens have been recorded, but it is known from S.E. Arabia, the S.W. corner of the Rub al Khali and Riyadh.

The smallest of the three is a fennec fox, *Fennecus* sp., which is about the size of a cat<sup>1</sup> and has huge ears. It is the palest of the three. The only other specimen on record besides Bertram Thomas's is one which was presented to the London Zoo by Mrs. Dickson of Kuwait, near where the animal was captured. This specimen died in July 1935 and is now in the British Museum—B.M. 25. 8. 4. 1.

25. *Vulpes vulpes arabica* Thos.—Arabian Fox.

*Vulpes leucopus* Blyth, O. Thomas, 1894, *Proc. Zool. Soc. Lond.*, p. 450, Muscat. See also Anderson & de Winton, 1902, p. 222.

*Vulpes nilotica* Geoffr., O. Thomas, 1895, *Proc. Zool. Soc. Lond.*, p. 548, Aden.

*Vulpes vulpes arabica* O. Thomas 1902, *Ann. Mag. Nat. Hist.*, 10: 489, type loc.: Muscat; J. G. Dollman in B. Thomas, 1932, p. 339. R. I. Pocock, 1935, *Ann. Mag. Nat. Hist.*, 15: 450.

Taif	♀	Collector's number	4	23. v. 1934
Jidda	♂	„ „	5	19. ii. 1934
„	♂	„ „	7	26. ii. 1934
„	♂	„ „	10	9. iii. 1934
Kharj	♀	„ „	44	13. x. 1934
„	♀	„ „	45	13. x. 1934
Abha	♂	„ „	88	10. vi. 1936
Najran	♂	„ „	94	29. vi. 1936
„	♂	„ „	96	29. vi. 1936
Dhahran	♀	„ „	146	20. xi. 1936
Riyadh	♂	„ „	166	6. vii. 1938

I am in some doubt as to whether these Arabian foxes should not be included in *Vulpes vulpes pusilla* Blyth. Thomas originally referred some foxes from Muscat to *Vulpes leucopus* Blyth which Pocock (1936, p. 46) shows to be a synonym of *pusilla*. A year later Thomas tentatively referred two specimens from Aden to *Vulpes nilotica* Geoffr. on account of their size and drew attention to the fact that some of the Muscat specimens were like the Aden ones. Later still he decided to call them (i.e. the South Arabian foxes) *Vulpes vulpes arabica*, and in his description of this form he says that the size is intermediate between *V. vulpes* and *V. leucopus*. There were only six skulls available at the time, from Muscat<sup>2</sup> and Aden, three ♀ ♀ with condylobasal lengths 126, 126.5, 123.5 and three ♂ ♂, 135.3, 140, 120.4 millimetres. From these figures it would appear that the Arabian *Vulpes vulpes* are distinctly larger than *leucopus*, but more material which has since come to hand shows that Thomas's specimens were exceptionally large ones; the average condylobasal length seems to be 127.2 for males and

<sup>1</sup> Bertram Thomas (1932, p. 236) says that it was referred to as "harr," which is classical Arabic for "cat." His specimen came from the Rub al Khali in longitude 51° E.

<sup>2</sup> Blanford, 1888, *Fauna of British India—Mammalia*, p. 152, mentions *leucopus* from Muscat.



118.7 for females. Specimens of *pusilla* from Baluchistan, S. and W. Persia and 'Iraq fit in with these dimensions though *pusilla* from the type locality (Salt Range, Punjab) are certainly smaller. The Salt Range, however, is the extreme eastern end of their range.

The description of *arabica* says: "ear-backs rarely deep black, more often greyish, and sometimes scarcely darker than the head." The words "rarely," "often" and "sometimes" are rather misleading seeing that there were but six specimens. There are now twenty specimens from S. Arabia and ten from Central Arabia in the British Museum, and the only ones which lack the deep black ears are three of the paratypes. Taking the above into consideration it may well turn out that the Arabian foxes of the species *vulpes* should be included in the race *pusilla*, but for the moment I prefer to regard this as a speculation.

The Arabian *Vulpes vulpes* do, however, appear to be distinguishable by size from the Egyptian ones. Unfortunately many of the earlier specimens of foxes bear no information about the sex of the animal so that they are not very helpful, but I have seen a fair number of adult sexed specimens and the following are their measurements:

	Number of specimens.	Condylbasal lengths—extremes.	Condylbasal lengths—means.	Standard deviation.
<i>V. v. aegyptiaca</i> Sonn. :				
Males . . . . .	5	123.5-140.3	133.9	7.0
Females . . . . .	10	115.7-129.3	126.4	4.4
<i>V. v. arabica</i> Thos. :				
Males . . . . .	11	116.6-140	127.2	6.3
Females . . . . .	10	113.6-126	118.7	4.5

In Palestine *V. v. arabica* seems to meet a more northern form. Some of the skins from Palestine have smokier flanks than *arabica* and there is one specimen from Ramleh—B.M. 19. 4. 11. 8. ♀—which is much greyer than any of the other Palestine skins and which Thomas made the type of *V. v. palaestina*.<sup>1</sup> Then there are other skins from Palestine which exactly match the Arabian foxes. Bodenheimer (1935, p. 111) says: "Several Foxes occur in Palestine, each of which represents one zoogeographical region. In the southern and eastern deserts and steppes the slender, dull reddish-grey Egyptian Fox (*Vulpes nilotica*) is frequently found. Its burrows have been observed to the south of the Arabah. This form still prevails in the southern Philistine plain and the mountains of S. Judaea. The prevailing form of the Mediterranean sections from Ramleh and Jerusalem up to the Lebanon is the reddish-grey Palestine Fox (*V. palaestina*). The Tawny Fox (*V. flavescens*)<sup>2</sup> is an Irano-Turanian intruder in Galilee. It is the largest of the three forms. It is of a bright, light-yellowish colour, has black ears and a splendid brush."

There are no skins in the British Museum from Palestine south of Jerusalem and it is interesting to hear that the Egyptian Fox comes up here; moreover, the only specimens of *flavescens* which I have seen are from Persia. It would seem that the Palestine specimens which I assign to *arabica* are included by Boden-

<sup>1</sup> *Ann. Mag. Nat. Hist.*, 5: 1920: 122.

<sup>2</sup> I.e. *V. flavescens* Gray 1843 not *V. flavescens* Blyth 1853, which is a synonym of *V. v. pusilla* Blyth.

heimer in *palaestina*. If this is so, it is interesting in view of the fact that Pocock (1935, p. 450) gives *palaestina* as a probable synonym of *arabica*.

## 26. *Vulpes ruppelli sabaea* Pocock—Arabian Sand-fox.

*Vulpes ruppelli sabaea* R. I. Pocock 1934, *Ann. Mag. Nat. Hist.*, **14**: 636, type loc.: Rub al Khali; id., 1935, l.c., **15**: 452.

Three specimens. A ♂, collector's number 46, Riyadh, 5 November, 1934, skin and skull; a ♂, collector's number 61, Khafs, 23 February, 1935, skin and skull; collector's number 140, a skull picked up in a valley at Alam Abyadh.

These specimens extend the range of the subspecies in a north-westerly direction.

Pocock had four specimens at the time when he wrote his description, and as one of the above specimens is slightly larger than any of his it is worth recording its measurements: Number 46, ♂, head and body 451, tail 315, hindfoot 107, over-all length of skull 108.3, condylobasal length 104.0 mm.

It is quite likely that this is the fox mentioned by Yerbury & Thomas (1895, p. 543): "At the same time Yerbury believes that a second Fox and a second Hare are to be found in the district"—i.e. Aden. These authors record "*Vulpes nilotica* Geoffr. ?" (*V. v. arabica*). They also record *Lepus arabicus*, so the second hare is very likely *L. a. cheesmani* Thomas (q.v.).

## 27. *Canis lupus arabs* Pocock—Arabian Wolf.

*Canis lupus arabs* R. I. Pocock 1934, *Ann. Mag. Nat. Hist.*, **14**: 636, type loc.: Ain, S.E. Arabia; id., 1935, *Ann. Mag. Nat. Hist.*, **15**: 449 (amplified description).

*Canis hadramauticus* Th. Noack 1896, *Zool. Anz.*, **19**: 356, type loc.: Hadhramaut; id., 1897, *Zool. Anz.*, **20**: 368 (amplified description; Noack's species is a composite one made from a jackal and a wolf. The jackal was chosen as lectotype by Matschie).

*Canis lupaster* Hemprich & Ehrenberg 1830 (1833), Matschie, 1897, *S.B. Ges. Nat. Fr.*, p. 73, Aden.

*Canis lupus* subsp. (? aff. *pallipes*) Schwarz, 1926, *Senckenbergiana*, **8**: 43-47, Hadhramaut (this is Noack's wolf specimen).

Native name is *Dyb*. It is interesting to note that the Wolf-like Jackal of N.E. Africa, *Canis lupaster* Hemprich & Ehrenberg, is known in Egypt as *Deeb* (Flower 1932, p. 395) or as *Deib* or *Dib* (Anderson 1902, p. 214).

An adult ♀ shot by Mr. A. G. Griffin, 15 December, 1937, 18 miles N. of Jeddah, altitude 40 ft.

This specimen extends the range of *arabs* in a north-westerly direction.

The skin is sandy-coloured and there is an admixture of black on the back, flanks, face and tail. There is also a slight black streak on the foreleg above the wrist. The longer, coarser hairs down the spine form a sharply defined band some 100 mm. wide (wider between the shoulders); this band, together with the tail, has the black admixture, which is weak elsewhere, strongly developed. The belly is whitish.

The skull measurements are of interest and are comparable with those given by Pocock (1935) which include the wolf from the Hadramaut which, together with a jackal, was called *hadramauticus* by Noack. The following are the skull measurements of Mr. Griffin's specimen in mm.: over-all length 192, condylobasal length 179.5, zygomatic width 107, inter-orbital width 34, post-orbital width 38, P<sup>4</sup> 21.4, M<sup>1</sup> 14.0 × 18.2, M<sup>1</sup> + M<sup>2</sup> 20.9.

**28. Suncus** sp.—Shrew.

(?) *Crocidura murina* L., Thomas, 1894, *Proc. Zool. Soc. Lond.*, p. 449, Muscat.

Two specimens in alcohol from Jidda. Collector's number 4, ♂, 5 February, 1934; no number, ♀, 6 February, 1934.

**Paraechinus**—Hedgehogs.

*Paraechinus* Trouessart 1879, *Rev. Mag. Zool.*, p. 242.

Colour is an unreliable guide as these hedgehogs show a distinct tendency to melanism and a certain tendency to albinism. In one form, *dorsalis*, the belly is blotched dark brown and white, and the variation ranges from entirely brown to entirely white. I have considered the skulls more than the colour.

The Arabian members of the genus and those which are geographical neighbours seem to be divisible into the following species :

(1) *dorsalis* Anderson & de Winton 1901, *Ann. Mag. Nat. Hist.*, 7 : 42 ; type loc. : Hadhramaut.

This species has the skull comparatively short in the rostrum and broad in the pterygoid region and across the zygomatic arches. Bullae are large. P<sup>3</sup> is a mere peg or is missing. The spines of the dorsal area are dark and those of the flanks pale so that there is a marked dark band along the back. To this species belong *ludlowi*,<sup>1</sup> *albatius*<sup>2</sup> and *albior*.<sup>3</sup>

There are two specimens of *dorsalis* (B.M. 97. 1. 14. 1-2) which were collected at Muscat by Dr. Jayakar in 1896 and which had been put away in spirit labelled "Erinaceus." These must have been overlooked by Anderson and de Winton, who make no mention of them in their description of *dorsalis* (1901). There is another Muscat specimen of *dorsalis* (B.M. 1938. 9. 8. 1) which was collected in December (year ?) by Major Trevor. This skin resembles *albior*.

(2) *aethiopicus* Hemprich & Ehrenberg 1830 (1833), *Symb. Phys. Mamm.*, 2 : sheet k *recto* ; type loc. : "in desertis dongalanis."

This species has a short-snouted skull with large bullae and is broad across the zygomata, but is very small, much smaller than the preceding species. P<sup>3</sup> is a peg or is two-rooted. To this species appears to belong *oniscus*,<sup>4</sup> a melanistic form only known from the type.

(3) *deserti* Loche 1858, *Cat. Mamm. et Oiseaux d'Algérie*, p. 20, type loc. : Algeria.

The skull of this species closely resembles that of *dorsalis*, but the skin lacks the dorsal band of the latter. P<sup>3</sup> has two roots.

Anderson & de Winton (1901, p. 44) say that the skull of *dorsalis* resembles in general that of *aethiopicus*. I cannot agree ; the skulls of the typical series of *dorsalis* are far larger than those of *aethiopicus* and resemble much more closely *deserti*. It may be that *dorsalis* will turn out to be a subspecies of *deserti*.

On the other hand, I have seen two specimens of *dorsalis* (diagnosed by the dark dorsal band) whose skulls, though apparently fully adult, are small and more nearly resemble those of *aethiopicus*. These are Major Trevor's specimen from Muscat (1938. 9. 8. 1) and one of Dr. Jayakar's Muscat specimens (♂, 97. 1. 14. 2).

<sup>1</sup> Thomas 1919, *J. Bombay Nat. Hist. Soc.*, 26 : 748, type loc. : Hit, on the Euphrates.

<sup>2</sup> Thomas 1922, *Ann. Mag. Nat. Hist.*, 9 : 144, type loc. : Tanb Is., Persian Gulf.

<sup>3</sup> Pocock 1934, *Ann. Mag. Nat. Hist.*, 14 : 636, type loc. : W. Dhimir, Geradum, S. Arabia.

<sup>4</sup> Thomas 1922, *Ann. Mag. Nat. Hist.*, 10 : 307, type loc. : Fayush 7 miles N. of Sheikh Othman.



(4) *hypomelas* Brandt 1836, *Bull. Sci. Acad. Imp. St. Petersbourg*, 1: 32; type loc.: "pays des Turcomans"<sup>1</sup> (*macracanthus* Blanford 1875 from Carmania and *amir* Thomas 1918 from Afghanistan are synonyms).

This species has a long narrow skull, narrow in the pterygoid region and with small bullae. P<sup>3</sup> is three-rooted. There are wholly black and wholly white phases. To this species belong *niger*<sup>2</sup> and *sabacus*.<sup>3</sup>

(5) *blanfordi* Anderson 1878, *J. Asiat. Soc. Beng.*, 47: 208; type loc.: Rohri in Sind.

This species has small bullae. P<sup>3</sup> is three-rooted but the shape of the skull is intermediate between that of *hypomelas* and *dorsalis*. To this species belongs *seniculus*,<sup>4</sup> the black Tanb Is. form which Thomas described as a subspecies of *niger*.

### 29. *Paraechinus dorsalis dorsalis* And. & de Wint.

The following specimens may be identified thus. A couple, ♂ and ♀, from Taif, 31.v.1934, and three from S.W. Arabia, 1936 A, B and C. Only one of these is fully adult (1936 A, ♀) and its skull measurements in mm. are: over-all length 50.3, zygomatic width 32.4, post-orbital constriction 12.5.

### 30. *Paraechinus* sp.

There is a specimen from Hadda, ♀, 2.iii.1934, whose skull (sub-adult) agrees fairly well with those of *deserti*. The skull measurements in mm. are: over-all length 48.9, zygomatic width 28.3, post-orbital constriction 11.0.

This skin has the distal half of the spines dark brown with a short light tip save on the back of the neck and between the shoulders where the distal halves of the spines are entirely dark brown with no light tip. The face is entirely deep brown; the lower part of the inside of the ear is white; there is a white mark at the angle of the jaw but the chin is black; the belly is very dark brown, and so are the legs and feet. I am not sure where this specimen should be placed and prefer to wait till more specimens come to hand.

Mr. Philby has also sent two very young hedgehogs from W. Tasrir, 6.viii.1931. These have a cinnamon-coloured skin and uniformly coloured, ginger spines.

## BATS

### 31. *Pipistrellus* sp.—Pipistrelle.

One ♀, collector's number 47, Riyadh 1,800 ft., 8 November, 1934. This is not *P. kuhli ikhwanius* Cheesman & Hinton.

### 32. *Asellia tridens* E. Geoff.—Trident Bat.

*Rhinolophus tridens* E. Geoffroy 1813, *Ann. Mus. Hist. Nat. Paris*, 20: 260, type loc.: Egypt.

Ten ♂♂ and 3 ♀♀ (no numbers) from a coral rock quarry near Jidda, 22 April, 1934.

<sup>1</sup> Ognev 1927, *Zool. Anz. Leipzig*, 69: 210–211, says that the type loc. is N. Persia.

<sup>2</sup> Blanford 1878, *J. Asiat. Soc. Beng.*, 47: 212, type loc.: "juxta Muscat."

<sup>3</sup> Thomas 1922, *Ann. Mag. Nat. Hist.*, 9: 143, type loc.: El Kubar, 60 miles N. of Aden.

<sup>4</sup> Thomas 1922, *Ann. Mag. Nat. Hist.*, 9: 142, type loc.: Tanb Is., Persian Gulf.

**33. *Rhinolophus clivus* Cretz.—Horseshoe Bat.**

*Rhinolophus clivus* Cretzschmar in Rüppell 1826 (1828), *Atlas zu der Reise im nördlichen Afrika*, **1**, Säug., p. 47, type loc.: Mohila.

Two ♂♂ and 7 ♀♀, collector's numbers 19–21, 23–26 and two without numbers, Taif, July 1934.

One ♂, no number, Mecca, December 1934.

One ♂, B.M. 1937. 9. 20. 1, collected by W. H. Ingrams at Zeil, Seiyun, Hadhramaut, December 1936.

**34. *Rhinolophus hipposideros minimus* Heug.—Horseshoe Bat.**

*Rhinolophus minimus* Heuglin 1861, *Nova Acta Leop. Carol.*, **29**: 6, type loc.: Cheren.

One ♂, collector's number 40, Taif, 5,500 ft., 12th September, 1934.

**35. *Nycteris thebaica adana* K. And.—Long-eared Bat.**

*Petalia thebaica adana* K. Andersen 1912, *Ann. Mag. Nat. Hist.*, **10**: 548; type loc.: Myba, near Aden.

One ♂ and 1 ♀; no numbers, near Jidda (?).

Three ♂♂, collector's numbers 92, 105, 106, Najran 4,400 ft., June and July 1936. Local, name *Mussa*.

**36. *Taphozous perforatus haedinus* Thos.—Tomb Bat.**

*Taphozous perforatus haedinus* O. Thomas 1915, *J. Bombay Nat. Hist. Soc.*, **24**: 62, type loc.: Chanler Falls, Juaso Nyiro, Kenya.

Two specimens (sex ?), corral quarry near Jidda.

Two specimens (sex ?), collector's numbers 64 and 65, Shumaisi, 450 ft., 28 January, 1936.

**37. *Liponycteris nudiventris* Cretz.—Naked-bellied Tomb Bat.**

*Taphozous nudiventris* Cretzschmar in Rüppell 1826 (1830/31), *Atlas zu der Reise im nördlichen Afrika*, **1**, Säug., p. 70, type loc.: Giza.

One ♀, collector's number 97, Najran 4,400 ft., 30 June, 1936.

**38. *Rhinopoma* sp.—Mouse-tailed Bat.**

Four young specimens (unnumbered), 3 ♂♂, collector's numbers 92, 93 and 97, and one ♀, number 95, all from Najran, 4,400 ft., 30 June, 1936.

**39. *Otonycteris hemprichi* Peters—Long-eared Bat.**

*Otonycteris hemprichi* Peters 1859, *Monatsbericht Akad. Berlin*, p. 223, type loc.: "ex Hemprich & Ehrenberg's collection."

One ♀, collector's number 165, 'Anaiza 2,300 ft., 10 June, 1938. Two immature specimens, 153 from Hail 3,500 ft., 31 May, 1938, and 164 from 'Anaiza, 10 June, 1938.

## APPENDIX I.

## A SHORT BIBLIOGRAPHY FOR THE STUDY OF ARABIAN MAMMALS.

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## APPENDIX II

### MEASUREMENTS.

*Total length* or *over-all length* of skull as used in this paper means the total length of the skull between perpendiculars, including the incisors. Pocock does not include the incisors.

*Mandibular length* is the distance in a straight line from the posterior surface of the mandibular condyle to the ventral rim of the alveolus of  $I_1$ .

*Standard deviation*.—It is not often that a collection of mammals contains a sufficient number of any one species to be sure that the distribution curve for any factor is a normal one, but the standard deviation may still give some idea of the variation from the mean and saves having to give the measurements at length.

In some cases, therefore, the extremes, mean and standard deviation have been considered sufficient. The standard deviation has been worked as follows :

$$\sigma = \sqrt{\frac{\Sigma(\text{deviations})^2}{n}}$$

where " deviation " means the difference between the measurement of each specimen and the mean measurement, and " n " is the number of specimens. (For further details see—The British Association for the Advancement of Science, *Biological Measurements*, 1935, p. 12.)

*Hindfoot*.—This measurement does not include the claws.

### APPENDIX III.

#### LOCALITIES REFERRED TO IN THIS PAPER.<sup>1</sup>

	N.	E.		N.	E.
Abha . . . . .	18° 20'	42° 20'	Haraj Plain . . . . .	14° 50'	46° 40'
Abyan Mts. . . . .	near Aden		Harra Rahat . . . . .	21° 53'	40° 20'
Afalil . . . . .	46° 30'	15° 45'	Hasa Oasis . . . . .	just E. of Hufuf	
Ahl al Dhib . . . . .	18° 15'	42° 55'	Hawiya . . . . .	22° 10'	49° 30'
Alam Abyadh . . . . .	16° 00'	45° 42'	Hudhaiyib al Aranib	20° 30'	42° 40'
Anaiza . . . . .	26° 05'	43° 59'	Hufuf . . . . .	25° 22'	49° 30'
Aqda . . . . .	few miles N. of Hail		Husainiya . . . . .	18° 00'	44° 30'
			Ilha'az . . . . .	17° 10'	54° 10'
Arain . . . . .	15° 35'	46° 45'	'Iraq Well . . . . .	17° 40'	44° 00'
Arq Adu Da'ir . . . . .	16° 40'	45° 15'	Jabrin Oasis . . . . .	23° 15'	48° 55'
Ashaira . . . . .	22° 00'	41° 00'	Jadaliya . . . . .	17° 25'	44° 00'
Dailami . . . . .	20° 20'	42° 40'	Jafura Desert (centre)	24° 15'	50° 00'
Dawadami . . . . .	24° 40'	44° 30'	Jau al Khudaif . . . . .	15° 15'	46° 35'
Deriyot . . . . .	17° 10'	54° 10'	Jauf, W. . . . .	15° 45'	45° 10'
Dha'f Hills . . . . .	21° 30'	39° 30'	Jau Mulais . . . . .	16° 25'	45° 35'
Dhahran . . . . .	17° 40'	43° 30'	Jidda . . . . .	21° 30'	39° 00'
Dhalm . . . . .	22° 50'	41° 40'	Jurbaib . . . . .	17° 00'	54° 10'
Dhirawiya . . . . .	17° 27'	43° 37'	Karyatein . . . . .	34° 15'	37° 15'
Dhofar . . . . .	17° 00'	54° 00'	Khabb, W. . . . .	16° 50'	45° 10'
Dofar . . . . .	see Dhofar		Khafs . . . . .	25° 20'	46° 30'
Dohat al Salwa . . . . .	25° 10'	50° 40'	Kharj . . . . .	23° 55'	47° 30'
Farsan Is. . . . .	16° 50'	42° 00'	Khaur, El . . . . .	13° 15'	45° 15'
Ghumair, W. . . . .	16° 37'	45° 07'	Khufaiyya . . . . .	24° 35'	45° 00'
Hadda . . . . .	21° 30'	39° 30'	Khurma, W. . . . .	22° 00'	42° 00'
Hadhba . . . . .	17° 00'	45° 00'	Lahej . . . . .	13° 00'	44° 50'
Hail . . . . .	27° 31'	41° 44'	Loheia . . . . .	15° 40'	42° 30'
Hamdha . . . . .	19° 05'	43° 45'	Luwai, W. . . . .	25° 00'	40° 39'
Hammam, W. . . . .	14° 50'	46° 36'	Madina (station) . . . . .	24° 28'	39° 36'
Hanaka, W. . . . .	17° 25'	43° 55'	Markha, W. . . . .	14° 57'	46° 35'
Haqu . . . . .	17° 40'	42° 40'	Maswara . . . . .	17° 46'	43° 24'

<sup>1</sup> Some of these co-ordinates are only rough.

	N.	E.		N.	E.
Matau . . . . .	16° 30'	45° 38'	Samuda . . . . .	on Rakba Plain	
Mathnat . . . . .	part of Taif		Shabwa . . . . .	15° 25'	47° 00'
Mocha . . . . .	13° 15'	43° 15'	Sha'ib Arjan . . . . .	17° 40'	44° 00'
Mushainiqua . . . . .	16° 30'	45° 55'	Sha'ib Hanjur . . . . .	18° 15'	42° 45'
Najran . . . . .	17° 30'	44° 20'	Shaka . . . . .	13° 00'	44° 45'
Naq'a, W. . . . .	15° 30'	47° 15'	Shari . . . . .	27° 14'	43° 27'
Nejd . . . . .	a large district of		Shariya (= Sharaya)	21° 35'	40° 05'
	Central Arabia		Shukra . . . . .	13° 25'	45° 40'
Oqair . . . . .	25° 38'	50° 13'	Shumaisi . . . . .	21° 25'	39° 40'
Qaim . . . . .	21° 20'	40° 45'	Sirr al Yamani . . . . .	16° 20'	46° 50'
Qariya . . . . .	17° 12'	43° 10'	Suda . . . . .	18° 20'	42° 20'
Qunfidha . . . . .	19° 00'	41° 00'	Sudaihat Tract . . . . .	16° 00'	45° 50'
Rakba Plain . . . . .	22° 30'	41° 40'	Sumaika, W. . . . .	17° 56'	43° 48'
Ramlat Sabatain . . . . .	15° 40'	47° 00'	Taif . . . . .	21° 10'	40° 45'
Ras al Khabb . . . . .	15° 48'	47° 50'	Taraf al Ain . . . . .	15° 50'	47° 40'
Rass . . . . .	25° 50'	43° 40'	Tasrir, W. . . . .	between Riyadh	
Raushan . . . . .	20° 00'	42° 40'		and Dawadami	
Rikani . . . . .	21° 30'	39° 30'	Thar, W. . . . .	see 'Iraq Well	
Riyadh . . . . .	24° 35'	46° 40'	Uqla . . . . .	15° 25'	46° 50'
Ruwaik . . . . .	15° 55'	46° 10'	Wasil . . . . .	15° 00'	43° 39'
Sahlal . . . . .	15° 35'	47° 30'			

APPENDIX IV.

FORMS DESCRIBED AS NEW :	<i>Psammodon obesus dianae</i>	. . . . .	p. 192
	<i>Tatera philbyi</i>	. . . . .	p. 196

